Hair removal treatment using 1,064 nm long-pulsed Nd:YAG laser in auricular post reconstruction of microtia patient: Two case reports

Kartika Ruchiatan,[1] Erika Dewi Essary,[1] Reti Hindritiani,[1] RM Rendy Ariezal Effendi,[1] Rani Septrina,[2] Hendra Gunawan,[1] Oki Suwarsa[1]

[1]Department of Dermatology and Venereology, Faculty of Medicine, Universitas Padjadjaran - Dr. Hasan Sadikin Hospital, Bandung 40161, West Java; [2]Department of Plastic Surgery, Faculty of Medicine, Universitas Padjadjaran - Dr. Hasan Sadikin Hospital, Bandung 40161, West Java, Indonesia

Abstract

Microtia is a congenital anomaly of the external and middle ear with various degrees of severity. The hair growth on the reconstructed auricle causes aesthetic problems. We describe two cases about the successful epilation of unwanted hair in postauricular reconstruction of microtia patients using 1,064 nm long-pulsed neodymium: ytrium-alumunium-garnet (LP Nd:YAG) laser in Fitzpatrick skin type IV patients, using 6x6 mm tip, 35 J/cm^2 fluence, 10 ms pulse, and 1 Hz frequency with burnt of hair as an endpoint. On the follow up day 11 of case one and day 7 of case two, the hair reductions on treated auricles were 46% and 58%, respectively, with no adverse effects. Minimal 6 repeated sessions are recommended for optimal result. In these case reports, LP Nd:YAG laser treatment is considered effective for the unwanted hair growth on the reconstructed auricle in dark skin type patients with minimal risk of adverse effect.

Introduction

Microtia known as a congenital malformation that is characterized by unorganized cartilage remnants and a malpositioned lobule, with the various degrees of severity from mild structural abnormalities to the complete absence of the external and middle ear. The prevalence varies among countries from 0.83 to 17.4 per 10,000 births, and males are more often affected than females. Auricular reconstruction is a challenging reconstructive procedure, because of the complex anatomy of the external ear, towards the necessity to provide good projection and symmetry.[1] Unwanted hair is apparent in microtia patients with a low hairline after auricular reconstruction procedure.[2] In addition, the majority of patients have a low retroauricular hairline. Although ear reconstruction technology has been highly developed[3] in techniques and results of surgeries,[4] hair growth on the reconstruction ear has plagued both surgeons and patients.[3] Unwanted hair growth of the reconstructed ears of microtia patients can cause cosmetic problems,[4] physiological distress,[5] and known to be a therapeutic challenge.[6] There is a need for an effective, safe, and non-invasive treatment modality capable of removing hairs on a longterm basis.[7] Lasers known for its long-term results, non-invasive nature, minimal treatment discomfort, and the speed and ease with which procedures can be performed.[8] Therefore, lasers are now viewed as the gold standard for hair removal.[2] A variety of laser systems with varying wavelengths, pulse durations, spot size, and energy fluences are currently used for hair removal. Successful hair removal treatment require light to penetrate deep into the skin because it is necessary to obliterate the entire follicle.[8] Hair removal treatment using 1,064 nm long-pulsed neodymium: ytrium-alumunium-garnet (LP Nd:YAG) laser combined the wavelength advantage of the Nd:YAG and the longer pulse duration advantage of the other long-pulsed systems.[9] The aim of these two case reports were to show the successful hair removal treatment using 1,064 nm LP Nd:YAG laser in auricular postreconstruction microtia patients.

Case Reports

Case #1

A 37-year-old male who had congenital microtia of the right ear was referred to our department, with a complaint of excessive hair growth on the right ear two months after the second ear reconstruction surgery. The surgery using the skin of the scalp and the groin as donor sites. He was clinically examined and photo-documented before receiving the first laser treatment (Figure 1A). The physical examination showed unwanted hair growth on reconstructed auricular region (the right auricle). Dermoscopy examination revealed 147 vellus and terminal hairs (Figure 1B). Hairs were trimmed using a scissor immediately prior to laser therapy. The therapy session took place under topical anesthesia on the therapeutic area. A LP Nd:YAG with a wavelength of 1,064 nm was used. Appropriate parameters were chosen in accordance with Fitzpatrick skin type IV. A spot size of 6x6 mm, a fluence of 35 J/cm^2, a pulse duration of 10 ms, and 1 Hz frequency with burnt of hair as an endpoint. The observation of epilation was performed at 11 days after the irradiation (Figure 1C). The post-treatment region was examined by dermoscopy and showed 46% reduction rate of unwanted hair (Figure 1D). There were no side effects such as inflammation, oedema, ulcer, scar, and folliculitis of the epilated skin after irradiation.

Case #2

A 18-year-old female complaint with an excessive hair growth on the left ear. The patient had undergone stage I-II auricular reconstruction using the Nagata technique, with obvious hair growth in helix area of the reconstructed auricle two weeks after the surgery. She was referred to our department for opinion regarding hair removal at this unusual site. The skin of the scalp was used as a donor site. The physical examination of the left ear showed long, thick, and coarse hairs (Figure 2A). Dermoscopy examination revealed 152 vellus and terminal hairs (Figure 2B). The patient had Fitzpatrick

Correspondence: Erika Dewi Essary, Department of Dermatology and Venereology, Faculty of Medicine, Universitas Padjadjaran - Dr. Hasan Sadikin Hospital, Bandung 40161 Indonesia.
Tel.: +62222032426 ext. 3449.
E-mail: dr.erika1@gmail.com

Acknowledgments: The authors would like to extend our gratitude to the staff of the Department of Dermatology and Venereology, Faculty of Medicine, Universitas Padjadjaran who contributed to this work.

Key words: Auricular reconstruction; hair removal; microtia; Nd:YAG; unwanted hair

Contributions: All the authors contributed equally.

Conflict of interests: the authors declare no potential conflict of interest.

Funding sources: None

Received for publication: 1 February 2019.
Accepted for publication: 20 February 2019.

Dermatology Reports 2019; 11(s1):8076
doi:10.4081/dr.2019.8076

skin type IV. Before hair removal, the treatment area was trimmed with scissor (Figure 2C). The patient was set in a supine position and the head was turned to expose the involved ear. The 1,064 nm LP Nd:YAG laser was used under topical anaesthesia. A spot size of 6x6 mm, a fluence of 35 J/cm^2, a pulse duration of 10 ms, and 1 Hz frequency with burnt of hair as an endpoint. A significant reduction of unwanted hair (58% reduction hair amount) was observed 7 days after only one session compared to that observed before the treatment (Figure 2D). No adverse effects occured during the treatment.

Discussion

A two-step auricular reconstruction was planned in microtia patients. The first stage, the ipsilateral coatal cartilages are harvested to construct all anatomical segments. The second stage is generally carried out 6 months after the first[1] and skin grafting commonly used.[3] Although the techniques and results of surgeries for microtia have improved, microtia patients with low hairlines have aesthetic problems of hair growth when scalp skin is usually used for ear reconstruction.[4] Unwanted hair may only become apparent in the later stages of a reconstruction, sometimes hair begins to grow on the rim after a second stage release, and sometimes a full thickness graft from the groin begin to grow hair when a child progresses beyond puberty. The cells that responsible for hair growth are not actually located in the bulb but located in the the buldge zones. Thus, grafts with a substantial dermal component will grow hair.[2] Our cases showed that the use of skin graft taken from scalp and groin skin can lead to the undesired side effect of unwanted hair growth.

A variety of conventional methods are available for hair removal, such as shaving, plucking, waxing, chemicals,[3,6] and electrolysis[6] which provide temporary effects[3,6] and often involve adverse reactions.[3] Lasers are now viewed as the gold standard for hair removal,[2] and considered as the most efficient method for the reduction of unwanted hair.[5] Lasers have been used both to treat hairs prior to reconstruction and to treat the ears after reconstruction.[2] Laser hair removal systems are typically grouped into the following 3 categories on the basis of the type of laser or light source each uses: red light systems (694 nm ruby), infrared light systems (755 nm alexandrite, 800 nm diode, and 1,064 nm Nd:YAG), and intense pulsed light sources (590 to 1200 nm).[10] Lasers require an effective fluence, appro-

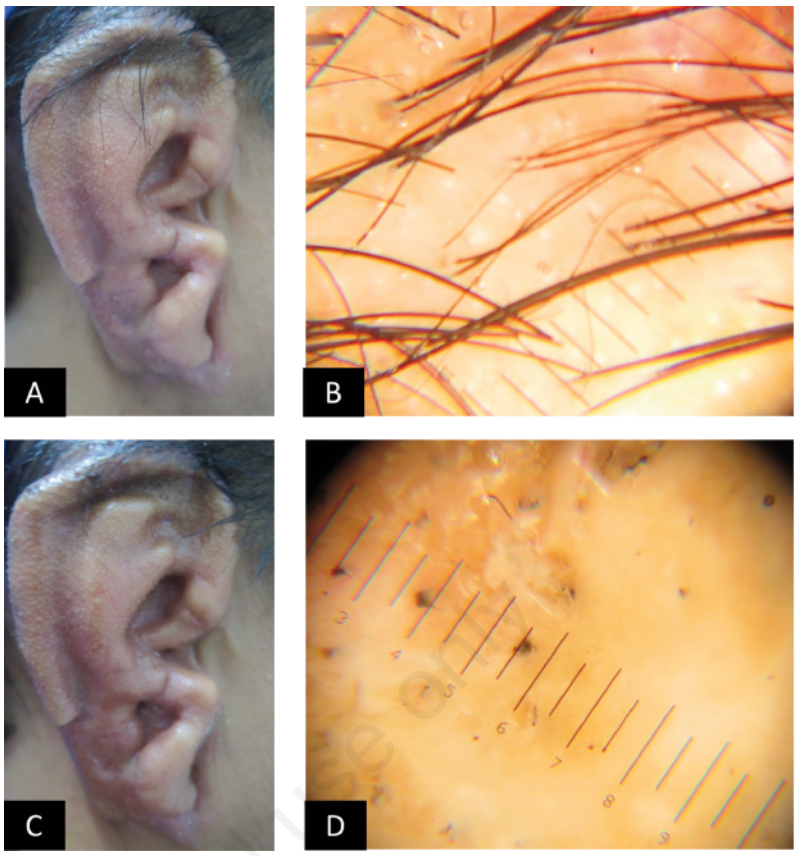

Figure 1. Clinical appearance. A. Before therapy. B. Dermoscopy examination before therapy. C. Day 11 after therapy. D. Dermoscopy examination day 11 after therapy.

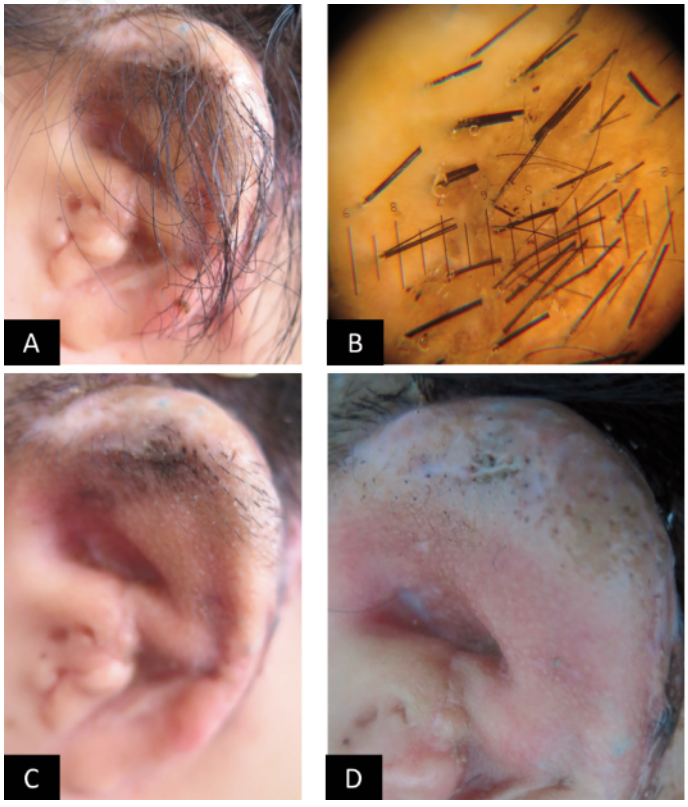

Figure 2. Clinical appearance. A. Before therapy. B. Dermoscopy examination before therapy. C. Trimmed area before therapy. D. Day 7 after therapy.

priate spot size for the area being treated for the successful treatment without complication.[5] However, some lasers can be poorly tolerated in dark skin type patients due to side effects of erythema, blistering, and post-inflammatory hyperpigmentation or hypopigmentation.[9] LP Nd:YAG laser is a safe treatment option for patients with the darkest skin phototypes (III-VI),[11] and known to be superior in both short term and long term studies.[7] Human hair growth in a cyclic pattern which consists of a growth or anagen phase, followed by intermediate degradation of a portion of the follicle known as the catagen phase, and then by a resting period when no growth occurs (the telogen phase).[11] Only lasers emitting energy with wavelengths ranging from 630 to 1,100 nm are potentially capable of irradiating the entire length of anagen hair follicles, which typically extend 2 to 5 mm into the dermis.[10] With most laser systems, a single treatment can reduce hair by 10-40%; three treatments by 30-70%; and repeated treatments as much as 90%.[11] Two cases of hair removal therapy in postreconstruction auricular of microtia patients with Fitzpatrick skin type IV using 1,064 nm LP Nd:YAG were reported. The laser using 6x6 mm tip, 35 J/cm^2 fluence, 10 ms pulse, and 1 Hz frequency with burnt of hair as an endpoint. On the follow up day 11 (case one) and 7 (case two) hair reduction were 46% and 58%, respectively.

The first report of reconstruction of microtia using laser hair removal was presented by Brent in 1999. Takase et al.[4] in 2007 experienced presurgical laser therapies of five microtia patients and examined these patients with quantitative analysis using video-microscope and histological examination. The diode laser system and the LP alexandrite laser system were used every 1 to 3 months for 1 year before the transplantation of costal cartilage. Presurgical laser hair removal is a useful technique for microtia patients because it is less invasive and safer than other surgical flap reconstructions and good cosmetic results can be achieved. Current laser hair removal systems are designed to irradiate as much of the follicle as possible.[10] In particular, for those with congenital microtia who were diagnosed between the ages of 6 and 18 years, the pain from laser hair removal might not be tolerated.[3] In our case reports, the patients had not done the presurgical laser treatment.

According to Guo et al.[3] study, the hair removal from the skin after the auricular framework was implanted had no negative impact on the cartilage framework underneath the skin. Alster et al.[10] study concluded that 1,064 nm LP Nd:YAG can achieve rates of hair reduction equivalent to those of other LP red and infrared laser, and intense pulsed-light system. The study also showed LP Nd:YAG laser can effectively treat patients with darker skin tones. There was no post-therapy adverse effect on both cases. Multiple laser treatments are necessary because laser only targets follicles in the anagen phase.[5] As a general rule, 6 to 10 laser sessions are required during the first year to achieve long-term epilation.[11]

Conclusions

Our cases highlight this undesirable effect of auricular reconstruction surgery where a dermatologist's help is called for. We suggest that the 1,064 nm LP Nd:YAG laser is a non- invasive method that can resolve the problem of postoperative unwanted hair on the reconstructed auricle, effective for hair reduction in darkly pigmented skin patients, and furthermore increasing patient statisfaction.

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